SWINE IMPROVEMENT PROGRAMS & PROCEDURES

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The Swine Record Performance (ROP) Program in Alberta, part of a Canada-wide joint federal-provincial project, has recently been renamed the "Swine Improvement Program" because a sow productivity portion has been added to the previous backfat and growth rate measurement service. Also, the term ROP was unfamiliar to people outside the program, especially foreigners. "Swine Improvement" will now refer to the total program; "ROP" will refer to the traditional backfat and growth rate measurement service and "sow productivity" will refer to that service.

Following are some questions producers may have about the new program in particular and the subject of breeding stock selection in general:

Q. I know good looking breeding stock when I see it. Why do I need this extra information?

A. That may be so, but just as you would not buy seed without knowing its germination rate, you should not be buying breeding stock without knowing about its performance. Appearance is only one part of at least three factors in selecting good breeding stock:

1. Performance Information — obtained from reliable impartial records, such as the Swine Improvement Program.
2. Health Status — from Animal Health Division, Alberta Agriculture, for herds on the provincial program or private practitioners for herds enrolled on their programs.
3. Physical Soundness and Suitability — determined by the buyer; in his absence the seller may be entrusted with this task.

This publication will deal only with the first point mentioned above — performance information.

Q. Why pay more than $300 for a boar?

A. That's a common comment and it is justified if he is not a good performing boar. But, did you know that buying superior performance tested boars that raise your market index 2 points in a 100 sow herd producing 1700

pigs per year in a 65 cent market will return an extra $1900 of value to your operation? Even without considering reduced days to market and superior feed efficiency, a superior performing boar will pay for itself just in terms of improved market indices. That's not to say you have to pay $1000 for a boar but the long-term advantages of a superior performing $600 boar are well worth the extra initial expense. Boars are, after all,"half the herd".

Genetics vs. Environment

Q. Why do you always come back to talking about backfat and growth rate on boars in selecting breeding stock? What about maternal traits such as mothering ability, litter sizes and weaning weights? Surely they're important. Why aren't you selecting for those?

A. We are selecting primarily for growth rate and backfat on boars because those traits are highly heritable (i.e. transmitted genetically). By highly heritable we mean in the neighborhood of 30 -50%. The balance is determined by environmental influence such as housing, feeding and management. When buying breeding stock you are only really buying the genetic portion since environments vary from farm to farm. Maternal traits, on the other hand, are much less heritable and highly influenced by environment. When you are buying animals on the basis of excellent maternal traits, most likely you are buying excellent management which may or may not be repeated on your own premises. We will deal with selection techniques for them later. The following table illustrates these points:

Trait	% Heritability (Genetics)	% Environment
Backfat	50%	50%
Growth rate (post-weaning)	30%	70%
Number farrowed	10%	90%
Number weaned	10%	90%
Weaning weight	20%	80%

NOTE: All figures are approximate. Adapted from "Genetics of Livestock Improvement" by J. F. Lasley.

Q. If there is such a large environmental component in maternal traits, how can one choose superior breeding stock in this area?

A. Just because maternal traits are not very heritable doesn't mean they're not important. It does mean, however, that to effect improvement with them using standard selection techniques on individual performance will not work because most of what you have selected is environment or nongenetic. So other methods must be employed.

First, choose breeds known for their mothering ability – generally, the white breeds such as Yorkshire, Landrace and Lacombe. Try to find lines within these breeds which have a consistently good history in the maternal traits. These traits can then be further enhanced in a crossbred female of the white breeds because of hybrid vigor (heterosis). Heterosis is improvement in performance beyond what would normally be expected when two genetically different breeds or lines within breeds are crossed. About a 20% increase in litter size and weaning weight can be expected when using crossbred females versus purebreds from which they originate. Also crossbred females generally have greater stamina to survive in today's intensive swine production units.

Q. Backfat thickness on breeding stock is supposed to predict lean meat yield of the carcass. How does the prediction accuracy of your system compare with the new grading system?

A. Our accuracy using four probe sites on the live pig is about 60%. The new grading system also has a 60% accuracy. Carcass grading sites are chosen to provide the best estimates of lean meat yield on the carcass whereas ROP probe sites have been selected to maximize predictability of lean meat on the *live* animal.

Q. Where can I find superior performing boars and gilts to stock my herd?

A. By performance we will assume you mean backfat and growth rate. As mentioned previously this is important in boars because these are the areas where they can be expected to show the most economic benefit. The obvious place to start looking is at performance test results. These are available from two sources within the Swine Improvement Program: home and station test

results. Station test results provide a means of comparing boars across herds whereas home test ranks animals within a herd, breed and sex. Now let's look at some results from each source and how to interpret them.

Station Test Sale Results (Boars)

FINAL SALE NOTICE (partial)
PERFORMANCE TESTED BOARDS
Leduc (Nisku) ROP Test Station Phone 986-5055
FRIDAY, April 11, 1986 @ 1:30 p.m.

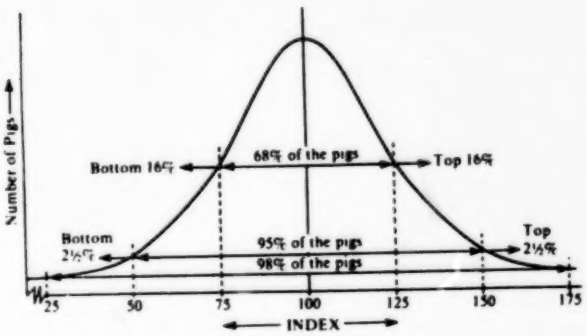
The 23 boars catalogued here were selected on the basis of above-average performance and physical soundness from among 60 boars in the contemporary group which have completed test to date. A station test under uniform environmental conditions allows comparisons between boars for their genetic potential to sire lean, fast growing pigs with efficient feed conversion. All boars in the sale are from herds inspected under the Alberta Swine Herd Health Program and are guaranteed to be breeders.
NOTE: Boars are indexed "within breed"; therefore, do not compare indexes between breeds. Feed conversion and age are not in the index. Feed conversion is calculated as an average for the two or more boars per pen.
(1) after sire's I.D. denotes semen from the Alberta Agriculture Swine Breeding Centre.

Lot No.	Breeders' Name	Breed	Sire's Tattoo	Boar's Tattoo	Birth Date	1 INDEX	2 Average Backfat (mm)	3 Gain/day on test (kg.)	4 Average F.C. per pen	5 Age adj. to 90 kg. (days)
1	John Doe	York	KKEF 3160R	KKEF 2653T	Oct 24	160	12.3	1.10	2.54	130
2	John Doe	York	KKEFF 222S	KKEF 2642T	Oct 22	137	12.7	1.00	(2.49)	134
3	John Doe	York	KKEF 2193S	KKEF 2600T	Oct 18	135	14.0	1.06	2.39	135
4	John Doe	York	KKEF 2186S	KKEF 2552T	Oct 18	131	12.9	0.98	2.41	140
5	Farm X	York	BUFA 484S(1)	RITR 988T	Oct 20	131	14.2	1.05	2.44	139
6	Farm X	York	RITR 205R	RITR 965T	Oct 19	130	13.9	1.03	2.58	137

Explanation of Terms Used:

1. Index — This is a mathematical formula which takes into account backfat and average daily gain on test (from 30 to 90 kg). It is not directly comparable to the market index. Animals are indexed within breed and compared to all boars of the same breed which have been tested in that station in the past 12 months. The index is designed to rank animals according to the following distribution:

Index Distribution



100 Index is average for the herd by breed and sex
68% of the pigs should fall between 75-125 Index
95% of the pigs should fall between 50-150 Index
98% of the pigs should fall between 25-175 Index

Boars are listed from highest index down to 100 which is average. Anything under 100 is automatically culled.

2. Average Backfat (mm) — This is the average of 4 backfat measurements adjusted to 90 kg.
3. Gain/Day on Test (kg) -This is the actual gain per day on test between 30 and 90 kg.
4. Average F.C. Per Pen -The average feed conversion of the two or more boars per pen. This is an estimate of the sire's feed conversion ratio. Not used in index calculation.
5. Age Adjusted to 90 Kg (Days) -The days from birth to 90 kg. There are two different environments involved in this figure; the pre-test one on the farm and the actual test period in the station. Due to pre-test environment effect, ADG is used for indexing purposes.

Home (Farm) Test Results (Boars) (partial)

Breeder & telephone	Sire Identification	SIRE E.B.V. 2 Fat (mm)	Age (days)	Pig Identification	3 Backfat (mm to 90 kg	4 Age Days to 90 kg	5 Index
Farm "A" 000-0000	12 month average 1			140 pigs	(11.7)	(147)	
	ANZI 386 3P	-1.9	+7.8	ARBF 744T	10	16.7	68
	ANZI 386 3P			ARBF 763T	9.6	156	100
	ANZI 386 3P			ARBF 764T	7.8	153	119
	ANZI 832 S	-2.2	+0.4	ARBF 784T	10.3	148	110
	ANZI 832 S			ARBF 785T	11.8	171	53
	ANZI 832 S			ARBF 797T	14.2	141	93
	ANZI 832 S			ARBF 829T	10.6	135	133
Farm "B" 000-0000	12 month average			199 pigs	(13.1)	(163)	
	AOET 1395S			JKAA 1192T	15.4	187	39
	JKAA 982S			JKAA 1231T	15.2	177	55
	JKAA 0729P	-0.5	-0.8	JKAA 1251T	13.5	167	90
	JKAA 0729P			JKAA 1254T	15.0	159	83
	JKAA 0729P			JKAA 1262T	15.4	164	71
	JKAA 0729P			JKAA 1263T	14.0	159	95
	JKAA 0729P			JKAA 1264T	13.5	167	90
	JKAA 0729P			JKAA 1266T	16.9	167	48
	JKAA 0729P			JKAA 1267T	15.6	169	61
	JKAA 561S			JKAA 1270T	15.0	141	108
	JKAA 0792P	-0.5	-0.8	JKAA 1280T	15.4	143	100
	JKAA 0792P			JKAA 1282T	13.4	144	123

1. 12 Month Average — The number of boars of that particular breed that have been tested on that farm in the past 12 months. The 12 month rolling average is phenotypic (genetic and environmental) performance of a herd. It is used as the base for developing the herd's indexes. As can be seen, every farm has its own unique index base. Where the 12 month average is not shown, it means that test results are not yet available from the minimum of 20 pigs in that breed and sex to form an index base. It is desirable to have fairly a large number of pigs tested to develop this (e.g. 50 or more). Small numbers can be misleading and may indicate that a fair cross-section of the herd is not being tested. Small numbers cause an unstable index base. Numbers must be related to herd size, of course.
2. Sire's EBV — Explained later in this pamphlet.
3. Backfat — The average of four backfat measurements adjusted to 90 kg.
4. Age — Days from birth to 90 kg adjusted to 90 kg.
5. Index — This ranks the individual pigs in relation to the herd average according to the previously shown distribution.

Home (Farm) Test Results (Gilts) (partial)

Breeder Address & telephone number	12 Month Average # Probed	Backfat (mm)	Age (days)	Probe Period Date	# Probed	Avg BF	Avg Age
Farm "A" 000-0000	342	12.9	155	April 1 - 15	23	11.2	160
Farm "B" 000-0000	223	14.5	171	April 1 - 15	8	13.4	163
Farm "C" 000-0000	73	14.9	148	April 1 - 15	1	10.2	149

The gilt report shows the same basic information as the boar report except individual gilts are not listed due to the large numbers involved (about 10,000 per year). The total number tested in a certain probe period is shown and the average results for that group. Individual results are available from the breeder, the regional swine technician for that area or the Swine Improvement Section of Pork Industry Branch in Edmonton.

Q. Why do you adjust to 90 kg in your calculations instead of 100 kg which is much closer to market weight, so that we could find out how long it would take for these animals to actually get to market?

A. Selecting breeding stock and selecting market pigs are really two separate issues. At 90 kg, breeders still have time to make their selections and market their culls without penalty. The important point in performance testing potential breeding stock is that all animals are compared on a standard basis. In any event, the relative ranking of animals will be expected to be the same at either weight. As a rule of thumb you can add an extra 10-12 days for boars to get from 90 to 100 kg and 12-15 days for gilts.

Q. What steps should I follow then to select breeding stock?

A. We will answer that separately for boars and gilts because the emphasis is somewhat different.

BOARS

1. Determine the breed(s) that fits into your intended breeding program.
2. Find a supplier that has a health status similar to your own.
3. Study performance records to find superior performing individuals.

4. Go out to look at those superior performing boars and select the most physically sound boar you can afford. If you can't go yourself, you might entrust the seller to do this for you.

GILTS

1. Determine what will be the most productive purebreds, crossbreds or even lines within breeds from sow productivity records in terms of maternal traits for your operation.
2. Find a supplier who has a health status similar to your own.
3. Select the highest performing and soundest individuals you can find and afford.

Q. Even when I have followed the suggested steps for breeding stock selection, I have been disappointed with my market pigs in terms of market index and growth rate. The gilts have not produced the numbers or size of pigs I would have liked. Also, boars and gilts have not been as physically sound or lasted as long as I would have liked. Why?

A. There are many areas where breakdowns can occur between theory and practice. Let's look at some of these:

1. The performance testing and reporting program does not work flawlessly largely due to the environmental component in the traits measured. Test animals are often treated and housed quite differently on the breeder's farm than on the buyer's farm and this can be the biggest source of differences. Such things as pen size, stocking density, floor type, bedding and ventilation are some factors. In order to avoid disappointment in this area, choose stock from a similar environment to your own.
2. Similarly, it is difficult if not impossible to say exactly how the genetics of new stock matches that of your existing herd because genetic levels will likely also be different.
3. Remember boars grow faster than barrows which in turn grow faster than gilts. The order from leanest to fattest is boars, gilts and then barrows, so don't expect your feeder barn animals to equal the performance of your newest super-performing herd sire.
4. In order to make maximum progress in genetics which is a slow longterm project at the best of times, you must purchase breeding stock which is significantly better than what you have, otherwise the improvement will be negligible. For example, let's suppose the average fat on your sows is 17 mm. You purchase a new boar with 15 mm fat.

   We will assume no difference in environment. The resulting offspring (intact males) will be 16.5 mm because only one-half of the improved performance — the genetic half — is transferable.

   With the higher fat levels in gilts and barrows you probably won't see any improvement at all.

   However if you had selected a 12 mm sire, in a similar situation you could expect 15.5 mm male offspring and you should start to see some improvement on the feeder end.

Estimated Breeding Values

Q. If there is this mixture of genetics and environment in performance data, shouldn't there be a way to sort this out with modern technology?

A. Yes, this is precisely what's happening. A new statistical technique has been developed which separates the environmental component and expresses the genetic component only for potential breeding animals. The resulting figures are called *Estimated Breeding Values* (EBV's for short) and will be expressed as follows:

Sire or Dam XYZ Fat (mm) -.2 Age (days) -2.4

This means that this sire or dam has the genetic potential to reduce fat .2 mm and age 2.4 days compared with all the other sires and dams on the program in Western Canada at this time. The environmental component has been removed statistically. In future there will also be a repeatability (reliability) figure (%) attached to these to show how accurate these predictions are. A test animal starts with about 40% repeatability with its own record; the reliability figure rises from there as progeny, siblings and pedigree are added.

These figures are currently being generated on sires and dams. Sires' EBV's are now appearing in the Home Test Report (see sample) and are available on dams

from breeders or the Pork Industry Branch staff. Sire and dam EBV's from other regions are also available from the Pork Industry Branch.

Q. That's helpful information for sires and dams but what about the pigs coming off test? I still have to contend with a mix of genetics and environment in their performance figures and can't compare performance between farms.

A. That's true for now, but we hope starting in 1987 this will change and EBV's will be calculated on the farm and in the test station as animals come off test. This involves equipping technicians with microcomputers and decentralization of the ROP program to the local level. It will be a great step forward in the swine ROP program. As a result, Canada will have the most advanced national genetic swine evaluation program of any country in the world.

Q. Getting back to gilts, the point was made previously that these should be judged mainly on the basis of their maternal traits. How can one find out how good these are and keep track of them?

A. For many years the Pork Industry Branch has provided sow litter cards and sow summary cards, samples of which are illustrated:

Assessing Gilts

Alberta SOW - LITTER CARD (Partial) CARD No 21

AGRICULTURE SWINE R.O.P. PROGRAM

Breeder's Name HUFFNAGEL

Sire Id HUFF 611R Breed York

Dam Id HUFF 846P Breed York

04 02 86 Day/Mo./Year Litter Born	13 - 1 No. Alive/Dead 1st Inspection	14.5 Wt. of Live Pigs Born
12 No. Alive at 3 Days	- Pigs Added	- Pigs Taken Away
24 02 86 Dated Inspected	12 No. Observed	Inspector
58 28 Day Litter Wt.	12 No. at 28 Days	06 03 86 D/M/Y Weaned
10 03 86 Day/Mo./Year Sire Sow Rebred (1st)		Ø Day/Mo./Year Sire Sow Rebred (2nd)

Pig No	Sex	Teats	Other	Health Management Record
210	M	14		
211	M	14		Runt

SOW LITTER SUMMARY CARD

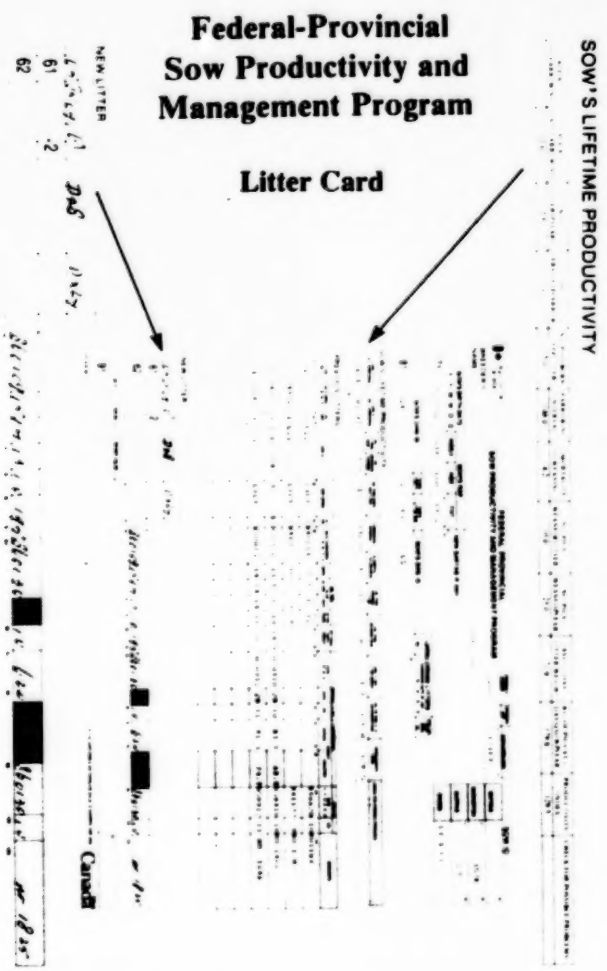
This is very good information in a format that is easy to follow and understand. Most people on the ROP program have been using this for many years and are glad to show you these records on request.

Other more detailed manual systems are the Pork Industry Record Keeping System for the Swine Unit, the Herdex Calculator System, various breeding wheels, the Easton Hog Carousel, and the Sowcalculator System, just to name a few.

With the advent of computers, various software programs have been developed such as the Canfarm Swine Management Program, Homestead, Countryside Data, Advanced Ag Software and one especially geared to breeding stock producers called Hog Management Information System.

One mail-in program that is being offered by the Alberta Swine Improvement Program to all swine producers, breeding stock or commercial, at no cost is the Sow Productivity and Management Program. It's fairly simple with one input card and two output reports. Input is a simple one-line entry under "new litter". Previous litters are stored in the computer and "sow's lifetime productivity" is recalculated after each litter.

There are also two output reports which can be obtained monthly. The first one is the "Sow and Boar Lifetime Productivity — Selection Worksheet". It lists all the gilts, sows and boars in the herd and their lifetime productivity so the whole herd can be evaluated by glancing at two or three pages. Superior sows and candidates for culling can be spotted at a glance.



The other is a report of the "Herd Productivity Summary". The average production of the herd gives the manager a good management tool to tell him how he's doing. There is a line showing change from last period which can highlight deteriorating performance before it becomes a problem. As well there is a comparative yardstick which shows how all other herds in the region are doing.

For further information on swine improvement programs or methods, contact your regional swine specialist or technician located at:

Lethbridge 381 -5108
Red Deer 340-5334
Vermilion 853-8109
Barrhead 674-8248
Fairview 835-2291

or the Pork Industry Branch at:

#204, 7000 - 113 Street
EDMONTON, Alberta
T6H 5T6
Phone: 427 -5319